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'POINT LOAD INDEX' USERS GUIDE: COMPUTER CALCULATION OF POINT LOAD INDICES AND ROCK STRENGTHS USING AN IBM-PC/AT

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POINT LOAD INDICES AND ROCK STRENGTHS USING AN IBM-PC/AT

by

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SUMMARY

This report describes the program 'POINT LOAD INDEX' which undertakes the calculation of point load index strengths, standardised index strengths (Is_{54} - NX size core equivalent) as well as uniaxial compressive and tensile rock strengths. The program is written in BASIC A Version 3.10 for an IBM-PC/AT.

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"INDICE DE CHARGE PONCTUELLE" GUIDE DE L'UTILISATEUR:
CALCUL PAR ORDINATEUR DES INDICES DE CHARGE PONCTUELLE ET
DE LA RÉSISTANCE DU ROC À L'AIDE D'UN IMB-PC/AT

par

M. Issard* et T.R.C. Aston**

RÉSUMÉ

Le présent rapport donne une description du programme "POINT LOAD INDEX" (indice de charge ponctuelle) qui permet de calculer l'indice de charge ponctuelle, l'indice normalisé (Is_{54} - NX équivalent à la dimension de l'échantillon) ainsi que la résistance à la compression et à la traction uniaxiales. Ce programme est écrit en langage BASIC A Version 3,10 pour un IMB-PC/AT.

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INTRODUCTION

At the Cape Breton Coal Research Laboratory (CBCRL), a program of point load testing, both cores and irregular lump samples, was undertaken to obtain preliminary rock and coal strength data for ongoing strata mechanics research programs. Currently, rock testing facilities at CBCRL are restricted to sample preparation, although a test frame is scheduled to become operational during 1987.

To date, a series of point load testing programs have been undertaken on coal samples from the Sydney Coalfield and elsewhere and the results presented (1,2,3).

A series of correction curves is normally used to standardise the rock index data to a reference diameter (usually 50 or 54 mm) (4). However, an extensive study (5) has shown that mathematical equations can be derived to represent the correction curves and therefore avoid problems normally associated with distortion and inadequate reproduction of the original chart.

A computer program, 'POINT LOAD INDEX', has been written to calculate both the actual and standardised point load indices as well as the uniaxial compressive and tensile strength of the samples. The program presents both the input data and final results in an orderly and easily readable form and eliminates the need for numerous repetitive hand calculations.

The 'POINT LOAD INDEX' program was originally written for use on a North Star microcomputer using G-BASIC language. However, the program has been revised for use on an IBM-PC/AT microcomputer using the BASIC A Version 3.10 language. The program is conveniently run using a 360 kB diskette and an EPSON FX100 Dot Matrix Printer. The user is expected to be familiar with the operation of microcomputers and the concept of point load testing.

A source listing of the program is given along with examples of the input data and output format.

POINT LOAD TESTING AND SAMPLE STANDARDISATION

The point load index, I , is derived using equation 1:

$$I = P/D^2$$

Eq 1

where P = Point Load (kN)
 D = Diameter of the Specimen (mm)

The diameter of a specimen can exert a significant influence on the derived value, even though the length/diameter criteria are maintained. It is therefore important to standardise the reporting of the index data according to specimen diameter.

Index values can be standardised using either a size correction chart (4) or equation 2 (5):

$$\text{Log}_{10} \text{Is}_{54} = 0.229 + \text{Log}_{10} \text{I} - 1.008e^{-0.0274(D)} \quad \text{Eq 2}$$

where I = Index Strength (kN)
 D = Specimen Diameter (mm)

The following relationships are also reported between the point load index, uniaxial compressive and tensile strengths (5):

$$\begin{array}{l} \text{Uniaxial Compressive Strength} \\ \sigma_c = 29.24 \text{ Is}_{54} \end{array} \quad \text{Eq 3}$$

$$\begin{array}{l} \text{Tensile Strength} \\ T_s = 2.78 \text{ Is}_{54} \end{array} \quad \text{Eq 4}$$

The 'POINT LOAD INDEX' program calculates index strength (I), standardised index strength (Is_{54} - standard NX size core), uniaxial compressive strength (σ_c) and tensile strength (T_s).

INITIAL MENU CHOICE

The 'POINT LOAD INDEX' program is driven by a series of menus. However, before any data is input, it is first necessary to determine whether the point load test apparatus used requires the use of a correction factor

for the cross-sectional area of the ram. The current program has two options:

- 1) The apparatus used by the Cape Breton Coal Research Laboratory (CBCRL), already has the correction factor for the cross-sectional area of the ram built into the mechanism. The specimen diameter and failure load (read directly from the gauges) can therefore be input directly into the program.
- 2) The apparatus used by the Cape Breton Development Corporation (CBDC), requires the gauge reading to be multiplied by the cross-sectional area of the ram (in this case 0.0014426 m^2). To simplify the calculation with this option, the specimen diameter and gauge reading at failure are input to the program and the failure load is automatically determined.

The use of the program with another test apparatus, where the ram area is different to that of the CBDC machine, would require the ram area constant to be altered within the main program.

PROGRAM USE

The 'POINT LOAD INDEX' program has a user friendly menu style operating system. The menu, lines 370 - 410 (Appendix A) contains the following options:

CREATE NEW FILE
CALCULATE PREVIOUS FILE
END SESSION

The 'CREATE NEW FILE' option only allows new files to be created into which the data is stored. At present, up to 100 data points can be input to a data file, although alteration of the dimension statement (line 310) would allow up to several hundred data points to be used. An example of the input data format is given in Table 1. Finally, it should be noted that the 'CREATE NEW FILE' option cannot be used to run the program.

SAMPLE #	DIAM (mm)	LOAD (KN)
1	61	1.550
2	50	1.275
3	47	3.200
4	31	1.825
5	42	1.975
6	33	1.675
7	25	1.750
8	28	1.775
9	57	3.625
10	43	2.125
11	66	1.850
12	52	2.000
13	64	2.625
14	43	2.000
15	34	1.825
16	26	1.150
17	58	3.175
18	46	2.775
19	30	1.400
20	25	2.100
21	60	2.225
22	55	3.400
23	27	2.125
24	41	1.475
25	31	0.975

TABLE 1 - LISTING OF INPUT DATA

CAPE BRETON COAL RESEARCH LABORATORY

PAGE 1 OF 1

LOCATION: COAL RESEARCH LAB

DATE: JULY 21 1986

OF TESTS: 25

FILE NAME: REPORT

SAMPLE DESCRIPTION: COAL IRREGULAR LUMP

POINT #	SPECIMEN DIAMETER mm	LOAD KN	Is MPa	Is54 MPa	TENSILE STRENGTH MPa	UNIAXIAL COMPRESSIVE STRENGTH (MPa)
1	61.00	1.550	0.42	0.46	1.27	13.34
2	50.00	1.275	0.51	0.48	1.33	14.01
3	47.00	3.200	1.45	1.29	3.60	37.83
4	31.00	1.925	1.90	1.19	3.32	34.87
5	42.00	1.975	1.12	0.91	2.53	26.62
6	33.00	1.675	1.54	1.02	2.83	29.78
7	25.00	1.750	2.80	1.47	4.09	43.05
8	28.00	1.775	2.26	1.31	3.63	38.18
9	57.00	3.625	1.12	1.16	3.23	33.97
10	43.00	2.125	1.13	0.95	2.65	27.97
11	66.00	1.850	0.42	0.49	1.37	14.38
12	52.00	2.000	0.74	0.72	1.99	20.97
13	64.00	2.625	0.64	0.73	2.02	21.24
14	43.00	2.000	1.08	0.90	2.49	26.23
15	34.00	1.825	1.56	1.07	2.93	31.35
16	26.00	1.150	1.70	0.92	2.57	27.00
17	58.00	3.175	0.94	1.00	2.77	29.12
18	46.00	2.775	1.31	1.15	3.20	33.64
19	30.00	1.400	1.56	0.95	2.64	27.78
20	25.00	2.100	3.36	1.77	4.91	51.66
21	60.00	2.225	0.62	0.67	1.86	19.55
22	55.00	3.400	1.12	1.14	3.17	33.00
23	27.00	2.125	2.91	1.63	4.54	47.71
24	41.00	1.475	0.88	0.70	1.94	20.44
25	31.00	0.975	1.01	0.64	1.77	18.63

MEAN VALUES

MEAN SPECIMEN DIAMETER = 43
 MEAN LOAD = 2.075
 MEAN Is = 1.37
 MEAN Is 54 = 0.99
 MEAN TS = 2.75
 MEAN UCS = 28.90

Table 2 - Output data format

To run the program, the 'CALCULATE PREVIOUS FILE' option must be used. If a new data file has just been created, this option is accessed and executed and the results output on the EPSON FX100 printer. The output file is not shown on the screen. If an old data file is required to be run, this option is also used for access and execution. An example of the output data format is given in Table 2.

To exit the program, the 'END SESSION' option is used.

ACKNOWLEDGEMENTS

A program to undertake the calculation of point load index strengths, standardised index strengths, uniaxial compressive and tensile strengths has already been written in G-BASIC language for the North Star microcomputer. The authors would therefore like to acknowledge the discussions undertaken with and help provided by Mr. D. Young of the CANMET, Cape Breton Coal Research Laboratory in converting the original North Star program for use on the IBM-PC/AT.

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APPENDIX A

```

10 REM *****
20 REM *
30 REM *          POINT LOAD INDEX
40 REM *          -----
50 REM *
60 REM *   THIS PROGRAM PROVIDES THE USER WITH A SERVICE THAT ALLOWS *
70 REM * THE STORAGE OF DESCRIPTIVE AND NUMERICAL DATA AND A PRINT OUT *
80 REM * OF CALCULATED RESULTS OF POINT STRESS DATA, PROVIDED BY THE *
90 REM * STRATA MECHANICS GROUP OF THE CAPE BRETON COAL RESEARCH LAB *
100 REM * ITORIES, 210 GEORGE ST., SYDNEY, N.S.
110 REM *
120 REM *****
130 REM
140 CLS
150 LOCATE 10,27
160 PRINT "POINT LOAD INDEX"
170 LOCATE 12,25
180 PRINT "CALCULATION PROGRAM"
181 LOCATE 20,1
182 INPUT "HIT RETURN TO CONTINUE...";P$
183 ON ERROR GOTO 4130
190 GOSUB 3760
200 PRINT " DO YOU WISH TO VIEW THE COMMENTS AND INSTRUCTIONS SECTION ""
210 INPUT " INPUT (Y) OR HIT RETURN TO CONTINUE ...";J$
220 IF J$="Y" OR J$="y" THEN 230 ELSE 250
230 INPUT " INPUT YOUR NAME ";Q$:GOSUB 3060
240 REM
250 REM -----THIS SECTION DIMENSIONS REQUIRED VARIABLES-----
260 REM
270 DIM A$(40),B$(80),C$(15)
280 DIM A(100),B(100),C(100),D(100),E(100),F(100),G(100),H(100)
290 A1=0: A2=0: A3=0: A4=0: A5=0: A6=0: Z=-14: P=15
300 REM
310 REM -----MENU SERVICES AVAILABLE (SEE COMMENTS)-----
320 REM
330 GOSUB 3760
340 PRINT TAB(16);"-----MENU-----"
350 PRINT TAB(16);"(1) ..... CREATE NEW FILE ..... "
360 PRINT TAB(16);"(2) ..... CALCULATE PREVIOUS FILE .... "
370 PRINT TAB(16);"(3) ..... END SESSION ..... "
380 PRINT TAB(16);"-----"
390 REM
400 IF J$="Y" OR J$="y" THEN RETURN
410 K=25: M=1: M1=1: K1=15: X$=" "
420 PRINT " "
430 INPUT "          INPUT SERVICE = ";Q
440 IF Q=1 THEN 450 ELSE 460
450 GOSUB 1790:GOTO 2110
460 IF Q=2 THEN 470 ELSE 490
470 GOSUB 2510:GOSUB 560:GOSUB 1150:GOSUB 1420:GOSUB 2470
480 GOSUB 1480:GOSUB 1590:GOSUB 1660:GOSUB 1620:GOSUB 2460
490 IF Q=3 THEN GOSUB 3050
500 GOTO 290
510 REM
520 REM ----THIS SECTION PROVIDES A LISTING OF POINT LOAD FILES----
530 REM

```

```

540 OPEN "I",#2,I$
550 REM
560 IF P$="N" OR P$="n" THEN 1000
570 X=1 : PRINT " "
580 OPEN "I",#1,"B:INDEX"
590 GOSUB 3910
600 IF EOF(1) THEN GOTO 680 ELSE GOSUB 950
610 INPUT #1,F$ : X=X+1
620 PRINT TAB(20);F$
630 GOTO 600
640 PRINT " " : PRINT " " : PRINT " "
650 INPUT "WANT TO LOOK AT ANOTHER FILE (Y) OR (N) ";P$
660 IF P$="Y" OR P$="y" THEN 4260 ELSE 560
670 PRINT " "
680 PRINT " "
690 INPUT "WANT A CLOSER LOOK AT A FILE (Y) OR (N) ";U$
700 PRINT " "
710 IF U$="Y" OR U$="y" THEN 710 ELSE 990
720 INPUT "INPUT FILENAME";F$
730 I$="B:"+F$
740 OPEN "I",#2,I$
750 GOSUB 2540
760 INPUT #2,A$,B$,C$,A,F$
770 IF LEN(A$)>15 THEN 760 ELSE 790
780 PRINT TAB(1);LEFT$(A$,15);GOTO 800
790 PRINT TAB(1);A$;
800 PRINT TAB(18);C$;
810 IF LEN(B$)>25 THEN 820 ELSE 830
820 PRINT TAB(30);LEFT$(B$,24);GOTO 840
830 PRINT TAB(30);B$;
840 PRINT TAB(60);PRINT USING "###";A$;PRINT TAB(67);F$
850 IF LEN(A$)>15 THEN 860 ELSE 870
860 PRINT TAB(1);RIGHT$(A$,LEN(A$)-15);
870 IF LEN(B$)>25 THEN 880 ELSE 890
880 PRINT TAB(30);RIGHT$(B$,LEN(B$)-24);
890 IF LEN(A$)>15 THEN 900 ELSE 910
900 PRINT TAB(30);
910 CLOSE #2;CLOSE #1
920 PRINT " " : PRINT " " : PRINT " "
930 INPUT "DO YOU WISH TO CALCULATE AND RECEIVE A COPY OF THIS FILE (Y) OR (N) ";
E$
940 IF E$="N" OR E$="n" THEN 640 ELSE 1070
950 IF X MOD 15 < 0 THEN RETURN
960 INPUT " "
970 P=P-15
980 CLS : GOSUB 3910: RETURN
990 CLOSE #1
1000 PRINT " "
1010 INPUT "DO YOU WISH TO CALCULATE A FILE AND RECEIVE A COPY (Y) OR (N) ";V$
1020 IF V$="Y" OR V$="y" THEN 1030 ELSE 290
1030 PRINT " "
1040 INPUT "INPUT DATA FILE FOR CALCULATION ";F$
1050 REM
1060 REM ----SELECTS FILE AND DETERMINES # OF PAGES----
1070 REM
1080 I$="B:"+F$
1090 OPEN "I",#2,I$

```

....HIT RETURN TO CONTINUE."

```

1100 INPUT #2,A$,B$,C$,A,F$
1110 CLOSE #2:FOR I=25 TO 100 STEP 25
1120     IF I>=A THEN GOTO 1140
1130     NEXT
1140 M1=I/25:RETURN
1150 REM
1160 REM ----READS AND CALCULATES POINT LOAD DATA FOR REPORT----.
1170 REM
1180 CLS
1190 W$=I$+"A"
1200 OPEN "I",#3,W$
1210 PRINT "PLEASE WAIT"
1220 INPUT #3, D
1230 IF D=2 THEN 3990
1240 X=0
1250 IF EOF(3) THEN 1380
1260 X=X+1
1270 INPUT #3, A(X), B(X), C(X)
1280 D(X)=C(X)/(B(X)*B(X)):D(X)=D(X)*1000
1290 E=-.0274*B(X)
1300 E(X)=.229 + LOG(D(X))/2.302585 - 1.006*EXP(E)
1310 E(X)=2.302585*E(X): E(X)=EXP(E(X))
1320 F(X)=2.78*E(X)
1330 G(X)=29.24*E(X)
1340 A1=A1+B(X)/A:A2=A2+C(X)/A:A3=A3+D(X)/A:A4=A4+E(X)/A
1350 A5=A5+F(X)/A:A6=A6+G(X)/A
1360 R$="KN"
1370 GOTO 1250
1380 CLOSE #3: RETURN
1390 REM
1400 REM ----PRINTS HEAD LINES FOR EACH PAGE IN REPORT ----.
1410 REM
1420 LPRINT CHR$(15)
1430 WIDTH "LPT1:",100
1440 LPRINT TAB(19);":":GOSUB 2480
1450 LPRINT "CAPE BRETON COAL RESEARCH LABORATORY":GOSUB 2490
1460 LPRINT " "
1470 LPRINT TAB(80);"PAGE":M;" OF ":M1:RETURN
1480 LPRINT " "
1490 LPRINT TAB(3);"LOCATION:":TAB(14):A$
1500 LPRINT " "
1510 LPRINT TAB(3);"DATE:":C$:TAB(35);":# OF TESTS:":A:TAB(60);"FILE NAME:":F$
1520 LPRINT " "
1530 LPRINT TAB(3);"SAMPLE DESCRIPTION:":TAB(25):B$
1540 LPRINT " "
1550 LPRINT TAB(10);"POINT #":TAB(23);"SPECIMEN":TAB(36);"LOAD":TAB(49);"IS":TA
B(61);"IS54":TAB(71);"TENSILE":TAB(82);"UNIAXIAL"
1560 LPRINT TAB(23);"DIAMETER":TAB(36);R$:TAB(49);"MPa":TAB(61);"MPa":TAB(71);"S
TRENGTH":TAB(82);"COMPRESSIVE"
1570 LPRINT TAB(23);"MPa":TAB(71);"MPa":TAB(82);"STRENGTH(MPa)"
1580 RETURN
1590 GOSUB 2480
1600 LPRINT TAB(1);":":TAB(94);": "
1610 GOSUB 2490
1620 RETURN
1630 REM
1640 REM ----PRINTS LINE BY LINE RESULTS FOR POINT STRESS TESTS----.

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```

1650 REM
1660 FOR I=1 TO A
1670 LPRINT TAB(10);LPRINT USING "0000";A(I);LPRINT TAB(22);
1680 LPRINT USING "0000.00";B(I);LPRINT TAB(34);LPRINT USING "000.000";C(I);
1690 LPRINT TAB(46);LPRINT USING "0000.00";D(I);LPRINT TAB(58);
1700 LPRINT USING "0000.00";E(I);LPRINT TAB(70);
1710 LPRINT USING "0000.00";F(I);LPRINT TAB(82);LPRINT USING "0000.00";G(I)
1720 IF I=K THEN 1730 ELSE 1750
1730 N=N+1:IF I=A THEN 1750
1740 GOSUB 2450:GOSUB 1440:GOSUB 2490:GOSUB 1490:GOSUB 1590:K=K+25
1750 NEXT
1760 RETURN
1770 CLOSE #2:CLOSE #1
1780 KILL I$
1790 CLS
1800 PRINT "INPUT FILE NAME."
1810 INPUT "THE FILENAME MUST BE LESS THAN 9 CHARACTERS: ";F$
1820 I$="B:"+F$
1830 OPEN "A",#2,I$
1840 CLOSE #2
1850 IF LEN(F$)/6 THEN ERROR
1860 OPEN "I",#1,"B:INDEX"
1870 IF EOF(1) GOTO 1910
1880 INPUT #1,I$
1890 IF F$=I$ THEN ERROR
1900 GOTO 1870
1910 CLOSE #1:GOTO 1920
1920 PRINT " "
1930 OPEN "B:INDEX" FOR APPEND AS #1
1940 I$="B:"+F$
1950 OPEN I$ FOR APPEND AS #2
1960 INPUT "INPUT LOCATION ";A$
1970 INPUT "INPUT SAMPLE DESCRIPTION ";B$
1980 INPUT "INPUT DATE SAMPLED ";C$
1990 INPUT "INPUT # OF DATA POINTS ";A
2000 B=A
2010 INPUT "IS THIS INFORMATION CORRECT (Y) OR (N) ";T$
2020 IF T$="Y"OR T$="y" THEN 2070 ELSE 1770
2070 WRITE #2, A$, B$, C$, A, F$
2080 PRINT #1,F$
2090 CLOSE #2:CLOSE #1:CLS:RETURN
2100 CLS:CLOSE #3
2104 REM
2105 REM ----UNITS OF FAILURE----.
2106 REM
2110 PRINT "IF THE POINT LOAD INDEX TESTING MACHINE HAS BEEN CALIBRATED
2120 PRINT "TO ACCOUNT FOR THE CROSS SECTIONAL AREA OF THE RAM, THE POINT
2130 PRINT "LOAD SHOULD BE ENTERED IN KN s. IF NOT TAKEN INTO ACCOUNT,
2140 PRINT "THE GAUGE READING SHOULD BE ENTERED IN MPa's."
2150 PRINT " "
2160 PRINT "(1)..... POINT LOAD (KN) ....."
2170 PRINT "(2)..... GAUGE READING (MPa) ....."
2180 PRINT " "
2190 INPUT "INPUT THE NUMBER CORRESPONDING TO YOUR INPUT UNITS ";G
2200 M$=I$+"."A"

```

```

2210 OPEN W$ FOR APPEND AS #3
2220 IF 0=2 THEN 2320 ELSE 2230
2230 IF 0=1 THEN 2240 ELSE GOTO 2100
2240   FOR I=1 TO 4
2250     R$="KN"
2260     CLS
2270     A(I)=1
2280     PRINT "INPUT DIAMETER IN (mm), FOR SAMPLE # ";I;INPUT " ";B(I)
2290     PRINT "INPUT LOAD IN (kNs) FOR SAMPLE # ";I;INPUT " ";C(I)
2300   NEXT
2310 GOTO 2410
2320   FOR I=1 TO 4
2330     R$="MPa"
2340     CLS
2350     A(I)=1
2360     PRINT "INPUT DIAMETER IN (mm) FOR SAMPLE # ";I;INPUT " ";B(I)
2370     PRINT "INPUT LOAD IN (MPa) FOR SAMPLE # ";I;INPUT " ";C(I)
2380   NEXT
2390 GOSUB 3540:GOSUB 2850
2400 GOTO 2420
2410 GOSUB 2760:GOSUB 2850
2420 GOSUB 3770
2430 CLOSE #3
2440 IF Z$="N" OR Z$="n" THEN CLS:GOTO 290
2450 LPRINT CHR$(27)^C^CHR$(24)
2460 LPRINT CHR$(12)
2470 RETURN
2480 LPRINT CHR$(27)^"-1":RETURN
2490 LPRINT CHR$(27)^"-0"
2500 RETURN
2510 REM
2520 CLS:INPUT "DO YOU WISH TO VIEW THE INDEX (Y) OR (N) ";P$
2530 RETURN
2540 CLS
2550 PRINT TAB(30);"POINT STRESS TEST FILES"
2560 PRINT " "
2570 PRINT TAB(11);"LOCATION";TAB(21);"DATE";TAB(35);"DESCRIPTION";
2580 PRINT TAB(55);" # OF TESTS";TAB(67);"FILE NAME"
2590 PRINT " "
2600 PRINT " "
2610 RETURN
2620 GOSUB 1590
2630 REM
2640 REM ----PRINTS FINAL AVERAGES TO REPORT----.
2650 REM
2660 LPRINT TAB(10);"MEAN VALUES"
2670 LPRINT " "
2680 LPRINT TAB(11);"MEAN SPECIMEN DIAMETER = ";:LPRINT USING "#####";A1
2690 LPRINT TAB(11);"MEAN LOAD = ";:LPRINT USING "#####";A2
2700 LPRINT TAB(11);"MEAN  $\epsilon$  = ";:LPRINT USING "#####";A3
2710 LPRINT TAB(11);"MEAN  $\epsilon$  S4 = ";:LPRINT USING "#####";A4
2720 LPRINT TAB(11);"MEAN TS = ";:LPRINT USING "#####";A5
2730 LPRINT TAB(11);"MEAN UCS = ";:LPRINT USING "#####";A6
2740 A1=0:A2=0:A3=0:A4=0:A5=0:A6=0
2750 RETURN

```

```

2760 CLS
2770 PRINT TAB(20);"TEST#";TAB(30);"DIAMETER";TAB(40);"LOAD"
2780 PRINT TAB(30);"DIA(mm)";TAB(40);"(KN)"
2790 PRINT TAB(20);"-----"
2800 RETURN
2810 REM
2820 REM ---THIS SECTION CONTAINS A SIMPLE EDITOR, IN WHICH THE USER---
2830 REM ---MAY CORRECT ANY INPUT ERRORS---.
2840 REM
2850   FOR I = 1 TO A
2860     PRINT TAB(20);A(I);TAB(30);B(I);TAB(40);C(I)
2870     IF I = K1 THEN 2880 ELSE 2900
2880     IF I = A THEN 2910
2890     GOSUB 2940:IF D=1 THEN GOSUB 2760 ELSE GOSUB 3940
2900     NEXT
2910 PRINT "END OF DATA"
2920 PRINT "-----"
2930 GOSUB 2940:RETURN
2940 INPUT "IS THERE ANY ERRORS IN THIS DATA (Y) OR (N) "; Z$
2950 IF Z$="Y" OR Z$="y" THEN 2960 ELSE 3000
2960 INPUT "INPUT ERRORED TEST# ";J
2970 PRINT "INPUT DIAMETER IN (MM), FOR SAMPLE # ";J;"INPUT " ";B(J)
2980 PRINT "INPUT LOAD IN ";R$;"PRINT" FOR SAMPLE # ";J;"INPUT " ";C(J)
2990 GOTO 2940
3000 Z=Z+15:IF D=1 THEN GOSUB 3820 ELSE GOSUB 4240
3010 GOSUB 3740
3020 GOSUB 3760
3030 K1=K1+15
3040 RETURN
3050 CLS:SYSTEM:END
3060 GOSUB 3760
3070 PRINT "HELLO THERE ";B$;"", MY NAME IS FCI. READ THE FOLLOWING "
3080 PRINT " TO BECOME FAMILIAR WITH ME."
3090 PRINT " "
3100 PRINT "          INSTRUCTIONS AND COMMENTS "
3110 PRINT "          ----- "
3120 PRINT " "
3130 PRINT "  THIS PROGRAM PROVIDES THE USER WITH A SERVICE THAT ALLOWS THE "
3140 PRINT "STORAGE OF DESCRIPTIVE AND NUMERICAL DATA AND A PRINT OUT OF CALCULATED "
3150 PRINT "RESULTS OF POINT LOAD DATA, PROVIDED BY THE STRATA MECHANICS GROUP OF "
3160 PRINT "THE CAPE BRETON COAL RESEARCH LABORATORIES, 210 GEORGE ST., SYDNEY, N.S."
3170 PRINT "  AFTER LOADING OF THIS PROGRAM, YOU WILL BE PROVIDED WITH A "
3180 PRINT "SERVICE MENU WHICH LOOKS LIKE THE FOLLOWING:"
3190 PRINT " "
3200 GOSUB 340
3210 GOSUB 3740
3220 GOSUB 3760
3230 PRINT " "
3240 PRINT "  INFORMATION ON THE SERVICE # 5 AVAILABLE....."
3250 PRINT " "
3260 PRINT "  SERVICE #1 PROVIDES YOU WITH THE ABILITY TO CREATE A NEW FILE."
3270 PRINT "IT WILL PROMPT YOU FOR INFORMATION ABOUT THE FILE AND FOR THE DATA"
3280 PRINT "IT WILL CONTAIN. YOU HAVE THE OPTION OF ESCAPING THIS SECTION WHEN"
3290 PRINT "ASKED IF YOU WISH TO CREATE THIS FILE SIMPLY BY PRESSING THE RETURN."
3300 PRINT "TO CARRY ON, INPUT THE LETTER (Y).(NOTE-ANY QUESTIONS ASKED IN THIS "

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3310 PRINT "PROGRAM ARE TO BE CARRIED OUT AS INSTRUCTED IN THE PREVIOUS STATEMENT)"
3320 PRINT "    IF YOU DECIDE TO CARRY ON, THE PROGRAM WILL PROMT FOR NUMERICAL "
3330 PRINT "DATA, THE FIRST BEING THE COAL SPECIMENS DIAMETER IN (mm), SECONDLY "
3340 PRINT "THE LOAD IN (KN's OR MPa's). THIS WILL CONTINUE TO BE CARRIED OUT "
3350 PRINT "TO A MAX # OF LINES AS INPUTED IN THE NEW FILE SECTION."
3360 PRINT "    THIS PROGRAM IS CAPABLE OF HANDLING INPUT FROM BOTH"
3370 PRINT "CALIBRATED AND UNCALIBRATED POINT LOAD INDEX TESTING MACHINES."
3380 PRINT "WHEN DEALING WITH CALIBRATED DATA, THE POINT LOAD IS ENTERED"
3390 PRINT "IN UNITS OF KN's. WHEN DEALING WITH THE UNCALIBRATED DATA,"
3400 PRINT "THE GAUGE READING IS ENTERED IN UNITS OF MPa's."
3410 GOSUB 3740
3420 GOSUB 3760
3430 PRINT "    THE PROGRAM THEN ASKS IF ANY ERRORS HAVE BEEN MADE. IF THERE ARE"
3440 PRINT "ERRORS AND YOU ANSWER (Y) TO THE QUESTION, THEN YOU WILL BE PROVIDED "
3450 PRINT "WITH AN EDIT SERVICE.(NOTE - IT IS A GOOD PRACTICE TO CHECK DATA EVEN"
3460 PRINT "IF YOU BELIEVE IT TO BE CORRECT.) THE PROGRAM WILL THEN SCROLL OUT 15 "
3470 PRINT "LINES OF DATA AT A TIME. IF ANY ERRORS HAVE BEEN DISCOVERED, YOU MAY "
3480 PRINT "CORRECT THEM BY ENTERING THE POINT# OF THE LINE TO BE CHANGED. YOU "
3490 PRINT "WILL THEN ENTER BOTH DATA ITEMS FOR THAT LINE AGAIN. THIS PROCESS CAN "
3500 PRINT "CARRY ON AS LONG AS YOU ENTER (Y) TO THE EDIT QUESTION. IF YOU TYPE "
3510 PRINT "IN (N) TO THE EDIT QUESTION, THE 15 LINES OF CORRECTED DATA WILL "
3520 PRINT "SCROLL OUT ON THE SCREEN. YOU MAY THEN PRESS RETURN TO REVIEW THE "
3530 PRINT "NEXT 15 LINES OF DATA WHICH WILL SCROLL TO THE SCREEN. ONCE ALL "
3540 PRINT "LINES OF DATA HAVE BEEN SHOWN , THE PROGRAM WILL THEN RETURN TO THE "
3550 PRINT "MENU."
3560 PRINT "    AT THIS POINT YOU HAVE THE CHOICE OF SELECTING THE PRINT OUT OF "
3570 PRINT "YOUR NEW FILE REPORT OR AN OLDER FILE REPORT. IF YOU SELECT SERVICE "
3580 PRINT "1 # 2, THE PROGRAM WILL PROCEED TO SCROLL UP A LIST OF ALL DATA FILES "
3590 PRINT "AND THERE DESCRIPTIONS. IF YOU WISH TO RECEIVE A COPY OF THE REPORT, "
3600 PRINT "THEN INPUT THE FILE DESIRED FROM THE LISTING. BE SURE TO INPUT THE "
3610 PRINT "FILE NAME CORRECTLY. IF INPUT INCORRECTLY, THE PROGRAM WILL RETURN TO"
3620 PRINT "THE SERVICE MENU. MAKE SURE THE PRINTER IS TURNED ON AND PAPER IS "
3630 PRINT "ABOUT 1 (cm) ABOVE PRINTING HEAD."
3640 GOSUB 3740
3650 GOSUB 3760
3660 PRINT "    AT ANY TIME YOU MAY SELECT ANY MENU ITEM AND WHEN YOUR FINISHED "
3670 PRINT "A SESSION, SELECT #3 FROM THE MENU."
3680 PRINT "    MAKE SURE YOU ARE FAMILIAR WITH BACKING UP THE WORK DISK WITH A "
3690 PRINT "DUPLICATE DISK IN CASE OF A (CRASH) OR DAMAGE."
3700 PRINT "    HAVE A GOOD SESSION 'G$;' AND A GOOD DAY !!!"
3710 GOSUB 3740
3720 GOSUB 3760
3730 J$=" ":RETURN
3740 PRINT "          .... HIT RETURN TO CONTINUE"
3750 INPUT T$:RETURN
3760 CLS:RETURN
3770 PRINT #3, G
3780   FOR I = 1 TO A
3790     PRINT #3, A(I), B(I), C(I)
3800   NEXT
3810 RETURN
3820 CLS
3830 PRINT TAB(20); "TEST#"; TAB(30); "DIAMETER"; TAB(40); "LOAD"
3840 PRINT TAB(30); "DIA(mm); TAB(40); "(KN)"
3850 PRINT TAB(20); "-----"

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3860 FOR L=2 TO Q
3870 PRINT TAB(20);A(L);TAB(30);B(L);TAB(40);C(L)
3880 IF L=K1 THEN RETURN ELSE 3890
3890 NEXT
3900 RETURN
3910 PRINT TAB(20);"FILES"
3920 PRINT TAB(20);"-----":PRINT " "
3930 RETURN
3940 CLS
3950 PRINT TAB(20);"TEST#";TAB(30);"DIAMETER";TAB(40);"LOAD"
3960 PRINT TAB(30);"DIA(mm)";TAB(40);"(MPa)"
3970 PRINT TAB(20);"-----"
3980 RETURN
3990 X=0
4000 IF EOF(3) THEN 1380
4010 X=X+1
4020 INPUT #3,A(X),B(X),C(X)
4030 D(X)=(C(X)+.0014426)/(B(X)*B(X));D(X)=D(X)*1000*1000
4040 E=-.0274*B(X)
4050 E(X)=.229 + LOG(D(X))/2.302585 - 1.008*EXP(E)
4060 E(X)=2.302585*E(X); E(X)=EXP(E(X))
4070 F(X)=2.78*E(X)
4080 G(X)=29.24*E(X)
4090 A1=A1+B(X)/A;A2=A2+C(X)/A;A3=A3+D(X)/A;A4=A4+E(X)/A
4100 A5=A5+F(X)/A;A6=A6+G(X)/A
4110 RS="MPa"
4120 GOTO 4000
4130 RESET
4140 CLS
4150 PRINT ER$;" ?ERR
4160 PRINT "YOU HAVE MADE AN ERROR OR FORGOT TO TURN ON THE PRINTER !!!"
4170 PRINT " "
4180 PRINT "FOR EXAMPLE, YOU MAY HAVE ENTERED A NONEXISTENT FILE FOR CALCULATION"
4190 PRINT " YOU MAY HAVE TRIED TO CREATE A FILE WHICH ALREADY EXISTS OR"
4200 PRINT " YOU MAY HAVE USED AN INVALID CHARACTER IN THE FILENAME."
4210 PRINT " "
4220 PRINT " ";GOSUB 3740;GOSUB 3760
4230 RESUME 290
4240 GOSUB 3740
4250 GOSUB 3860;RETURN
4260 CLS;X=1; PRINT " "
4270 OPEN "I:\01,"B:INDEX"
4280 GOSUB 3910
4290 IF EOF(1) THEN 4330 ELSE GOSUB 950
4300 INPUT #1,F#;X=X+1
4310 PRINT TAB(20);F#
4320 GOTO 4290
4330 PRINT " "
4340 INPUT "WHICH FILE ";F#
4350 GOTO 730

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